

APPENDIX I

GLOSSARY

AMPLITUDE STABILITY—Amplitude stability refers to the ability of the oscillator to maintain a constant amplitude in the output waveform.

ASTABLE MULTIVIBRATOR—A multivibrator which has no stable state. Also called free-running because it alternates between two different output voltage levels during the time it is on. The frequency is determined by the RC time constant of the coupling circuit.

ATTENUATION—The ability of a filter circuit to reduce the amplitude of unwanted frequencies to a level below that of the desired output frequency.

BANDPASS FILTER—A filter which allows a narrow band of frequencies to pass through the circuit. Rejects or attenuates frequencies which are either higher or lower than the desired band of frequencies.

BAND-REJECT FILTER—Rejects the passage of current for a small band of frequencies. Allows current to flow at frequencies either above or below this band.

BANDWIDTH—The range of frequencies included between upper and lower frequencies.

BISTABLE MULTIVIBRATOR—A multivibrator that has two stable states. It remains in one of the states until a trigger is applied. It then flips to the other stable state and remains there until another trigger is applied. Also referred to as a flip-flop.

BUFFER AMPLIFIER—An amplifier which isolates one circuit from another. It decreases the loading effect on an oscillator by reducing the interaction between the load and the oscillator.

CAPACITIVE REACTANCE—The opposition, expressed in ohms, offered to the flow of an alternating current by capacitance. The symbol for capacitive reactance is X_c .

CLAMPER—A circuit in which either the upper or lower extremity of a waveform is fixed at a desired value.

COMPLEX WAVE—A waveform other than a sine wave.

COUNTER—A circuit which counts input pulses.

CRYSTAL OVEN—Closed oven maintained at a constant temperature in which a crystal and its holder are enclosed to reduce frequency drift.

DAMPED WAVE—A sinusoidal wave in which the amplitude steadily decreases with time. Often associated with energy loss.

FILTER CIRCUIT—Network of resistors, inductors, and/or capacitors which offers opposition to certain frequencies.

FLYWHEEL EFFECT—The ability of a resonant circuit to operate continuously because of stored energy or energy pulses.

FREQUENCY CUTOFF—The frequency at which the filter circuit changes from an action of rejecting the unwanted frequencies to an action of passing the desired frequencies. Conversely, the point at which the filter circuit changes from an action in which it passes the desired frequencies to an action in which it rejects the undesired frequencies.

FREQUENCY STABILITY—Refers to the ability of an oscillator to accurately maintain its operating frequency.

HALF-POWER POINT—Point on either side of resonance curve at which the power is approximately 70 percent of the maximum value.

HARMONIC—Integral multiples of a fundamental frequency. For example, the harmonics of 60 hertz are 120 hertz, 180 hertz, 240 hertz, and so forth.

HIGH-PASS FILTER—A filter that passes a majority of the high frequencies on to the next circuit and rejects, or attenuates, the lower frequencies. Also called a low-frequency discriminator.

INDUCTIVE REACTANCE—The opposition to the flow of an alternating current (expressed in ohms) caused by the inductance of a circuit. The symbol for inductive reactance is X_L .

IMPEDANCE—Total opposition to alternating current flow. Impedance may consist of any combination of resistance, inductive reactance, and capacitive reactance. The symbol for impedance is Z .

LIMITER—A device which prevents (limits) a waveform from exceeding a specified value.

LOWER-FREQUENCY CUTOFF—The lowest frequency a circuit will pass.

LOW-PASS FILTER—A filter that passes a majority of the low frequencies on to the next circuit and rejects, or attenuates, the higher frequencies. Also called a high-frequency discriminator.

MULTIVIBRATOR—A form of relaxation oscillator which comprises two stages that are coupled so that the input of one is derived from the output of the other.

MONOSTABLE MULTIVIBRATOR—A multivibrator which has one steady state. A signal (trigger) must be applied to cause change of states.

NATURAL FREQUENCY—See Resonance Frequency.

NEGATIVE CLAMPER—The upper extremity of the output waveshape is clamped to a dc potential of 0 volts.

OSCILLATOR—An oscillator is a nonrotating device which produces alternating current. The frequency is determined by the characteristics of the device.

PARALLEL LIMITER—A resistor and diode connected in series with the input signal. The output is taken across the diode.

PARALLEL-NEGATIVE LIMITER—A resistor and diode connected in series with the input signal. The output is taken across the diode and the negative alternation is eliminated.

PARALLEL-POSITIVE LIMITER—A resistor and diode connected in series with the input signal. The output is taken across the diode and the positive alternation of the input signal is eliminated.

PARALLEL-RESONANT CIRCUIT—A resonant circuit in which the source voltage is connected across a parallel circuit (formed by a capacitor and an inductor) to furnish a high impedance to the frequency at which the circuit is resonant. Often referred to as a tank circuit.

PERIODIC WAVE—A waveform that undergoes a pattern of changes, returns to its original pattern, and then repeats the same pattern of changes. Examples are square waves, rectangular waves, and sawtooth waves.

POSITIVE CLAMPER—The lower extremity of the output waveshape is clamped to a dc potential of 0 volts.

PULSE—Signal characterized by a rapid rise and decay from an initial level.

PULSE OSCILLATOR—A sine-wave oscillator that is turned on and off at specific times. Also known as a ringing oscillator.

PULSE-REPETITION FREQUENCY (PRF)—The number of times in 1 second that a waveform repeats itself.

PULSE-REPETITION RATE (PRR)—Same as Pulse-Repetition Frequency (prf).

Q—Figure of merit (efficiency) of a circuit or coil. Ratio of inductive reactance to resistance.

QUIESCENT STATE—Time during which a tube or transistor of an electrical circuit is not performing its active function.

RC CONSTANT—Time constant of a resistor-capacitor circuit. Equal in seconds to the resistance value multiplied by capacitance value.

RC DIFFERENTIATOR—An RC circuit in which the output is taken from the resistor.

RC INTEGRATOR—An RC circuit in which the output is taken from the capacitor.

RC NETWORK—A circuit containing resistances and capacitances arranged in a particular manner to perform a specific function.

RC OSCILLATOR—An oscillator in which the frequency is determined by resistive and capacitive elements.

REGENERATIVE FEEDBACK—The process by which a portion of the output power of an amplifying device is fed back to reinforce the input.

RESONANCE—The condition in a circuit containing inductance and capacitance in which the inductive reactance is equal and opposite to the capacitive reactance. This condition occurs at only one frequency and the circuit in that condition is said to be in resonance. The resonant frequency can be changed by varying the values of either the capacitance or inductance.

RESONANT CIRCUIT—A circuit that contains both inductance and capacitance and is resonant at one frequency ($X_L = X_C$).

RESONANT FREQUENCY—That frequency in a given resonant circuit at which the inductive and capacitive values are equal and cancel each other.

RL DIFFERENTIATOR—An RL circuit in which the output is taken from the inductor.

RL INTEGRATOR—An RL circuit in which the output is taken from the resistor.

SELECTIVITY—The ability of a circuit to discriminate between frequencies.

SERIES-FED OSCILLATOR—An oscillator in which dc power is supplied to the amplifier through the tank circuit or a portion of the tank circuit.

SERIES LIMITER—The diode is connected in series with the output and the output is taken across the resistor. Either the positive or negative alternation of the input wave is eliminated.

SERIES-NEGATIVE LIMITER—The diode is connected in series with the output and the output is taken across the resistor. Eliminates the negative alternation of the input wave.

SERIES-PARALLEL CIRCUIT—A circuit in which two or more parallel or series combinations are in series with each other.

SERIES-POSITIVE LIMITER—The diode is connected in series with the output and the output is taken across a resistor. Eliminates the positive alternation of the input wave.

SERIES-RESONANT CIRCUIT—A resonant circuit in which the source voltage is connected in series with a capacitor and an inductor (also in series) to furnish a low impedance at the frequency at which the circuit is resonant.

SHAPING CIRCUIT—A circuit which alters the shapes of input waveforms.

STEP-BY-STEP-COUNTER—A counter which provides an output for each cycle of the input in one-step increments.

SHUNT-FED OSCILLATOR—An oscillator which receives its dc power for the transistor or tube through a path both separate from and parallel to the tank circuit.

TANK CIRCUIT—A tuned circuit used to temporarily store energy. Also referred to as a parallel-resonant circuit.

TICKLER COIL—Small coil connected in series with the collector or plate circuit of a transistor or tube and inductively coupled to a base or grid-circuit coil to establish feedback or regeneration.

TIME CONSTANT—Time required for an exponential quantity to change by an amount equal to .632 times the total change that can occur.

TRIGGER—Short pulse, either positive or negative, which can be used to cause an electrical function to take place.

TUNED CIRCUIT—Circuit consisting of inductance and capacitance which can be adjusted for resonance at a desired frequency.

UPPER-FREQUENCY CUTOFF—The highest frequency a circuit can pass.

APPENDIX II

SQUARE AND SQUARE ROOTS

N	N ²	√N	N	N ²	√N	N	N ²	√N
1	1	1.000	41	1681	6.4031	81	6561	9.0000
2	4	1.414	42	1764	6.4807	82	6724	9.0554
3	9	1.732	43	1849	6.5574	83	6889	9.1104
4	16	2.000	44	1936	6.6332	84	7056	9.1652
5	25	2.236	45	2025	6.7082	85	7225	9.2195
6	36	2.449	46	2116	6.7823	86	7396	9.2736
7	49	2.646	47	2209	6.8557	87	7569	9.3274
8	64	2.828	48	2304	6.9282	88	7744	9.3808
9	81	3.000	49	2401	7.0000	89	7921	9.4340
10	100	3.162	50	2500	7.0711	90	8100	9.4868
11	121	3.3166	51	2601	7.1414	91	8281	9.5394
12	144	3.4641	52	2704	7.2111	92	8464	9.5917
13	169	3.6056	53	2809	7.2801	93	8649	9.6437
14	196	3.7417	54	2916	7.3485	94	8836	9.6954
15	225	3.8730	55	3025	7.4162	95	9025	9.7468
16	256	4.0000	56	3136	7.4833	96	9216	9.7980
17	289	4.1231	57	3249	7.5498	97	9409	9.8489
18	324	4.2426	58	3364	7.6158	98	9604	9.8995
19	361	4.3589	59	3481	7.6811	99	9801	9.9499
20	400	4.4721	60	3600	7.7460	100	10000	10.0000
21	441	4.5826	61	3721	7.8102	101	10201	10.0499
22	484	4.6904	62	3844	7.8740	102	10404	10.0995
23	529	4.7958	63	3969	7.9373	103	10609	10.1489
24	576	4.8990	64	4096	8.0000	104	10816	10.1980
25	625	5.0000	65	4225	8.0623	105	11025	10.2470
26	676	5.0990	66	4356	8.1240	106	11236	10.2956
27	729	5.1962	67	4489	8.1854	107	11449	10.3441
28	784	5.2915	68	4624	8.2462	108	11664	10.3923
29	841	5.3852	69	4761	8.3066	109	11881	10.4403
30	900	5.4772	70	4900	8.3666	110	12100	10.4881
31	961	5.5678	71	5041	8.4261	111	12321	10.5357
32	1024	5.6569	72	5184	8.4853	112	12544	10.5830
33	1089	5.7447	73	5329	8.5440	113	12769	10.6301
34	1156	5.8310	74	5476	8.6023	114	12996	10.6771
35	1225	5.9161	75	5625	8.6603	115	13225	10.7238
36	1296	6.0000	76	5776	8.7178	116	13456	10.7703
37	1369	6.0828	77	5929	8.7750	117	13689	10.8167
38	1444	6.1644	78	6084	8.8318	118	13924	10.8628
39	1521	6.2450	79	6241	8.8882	119	14161	10.9087
40	1600	6.3246	80	6400	8.9443	120	14400	10.9545

For numbers up to 120. For larger numbers divide into factors smaller than 120.

Examples: $\sqrt{225}$ and $\sqrt{16200}$

$$\begin{aligned}
 225 &= 5 \times 45 & 16200 &= 100 \times 81 \times 2 \\
 \sqrt{225} &= \sqrt{5} \times \sqrt{45} & \sqrt{16200} &= \sqrt{100} \times \sqrt{81} \times \sqrt{2} \\
 \sqrt{225} &= 2.236 \times 6.7082 & \sqrt{16200} &= 10 \times 9 \times 1.414 \\
 \sqrt{225} &= 15 & \sqrt{16200} &= 127.26
 \end{aligned}$$

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